

Optimal Realtime Damage Identification in Composite Structures, Phase I

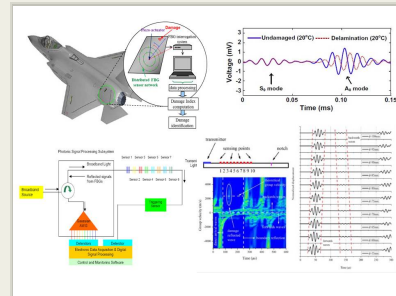
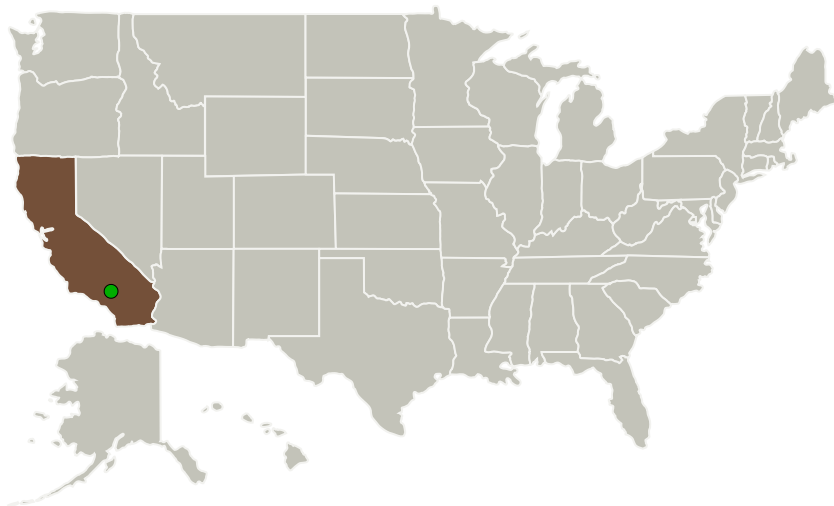
Completed Technology Project (2016 - 2016)



Project Introduction

Intelligent Fiber Optic Systems Corporation (IFOS) proposes to develop an effective real-time, in situ damage locating and growth monitoring system of composite structures by optimizing a smart, high-speed fiber Bragg grating (FBG) sensor and piezoelectric actuator placement strategy. A new damage identification technique is proposed from which damage in composites such as delamination and impact-related defects can be detected. The proposed technique utilizes the pitch-catch Lamb wave signals obtained from an FBG sensor and piezoelectric actuator network, without the need of baseline signals from the pristine condition. The project goals include designing an ultra-high-speed/high resolution, small footprint FBG sensor and piezoelectric actuator network plus an FBG interrogator, constructing a system model, fabricating a test platform and developing signal processing algorithms to identify and measure Lamb wave signals in the presence of a quasi-static background strain field. The system model will demonstrate proof-of-principle, and the test results will provide proof-of-functionality of the proposed sensor system as a measurement method for damage identification in composite structures. The methodology proposed by IFOS includes using advanced signal processing algorithms. IFOS and its collaborators in this project will develop a Phase II plan that includes a development and integration strategy, potential demonstration opportunities, program schedule, and estimated costs.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Intelligent Fiber Optic Systems Corporation	Lead Organization	Industry	Santa Clara, California
● Armstrong Flight Research Center (AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations

California

Project Transitions

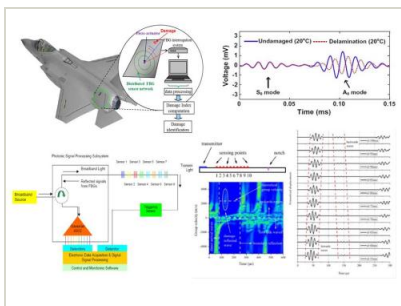
**June 2016:** Project Start**December 2016:** Closed out

Closeout Summary: Optimal Realtime Damage Identification in Composite Structures, Phase I Project Image

Closeout Documentation:

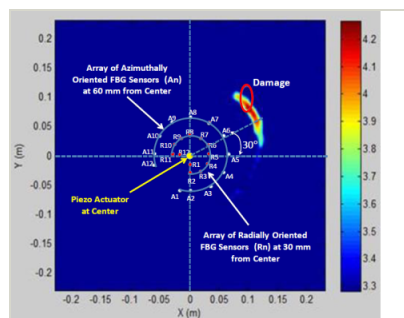
- Final Summary Chart Image (<https://techport.nasa.gov/file/139875>)

Images

**Briefing Chart Image**

Optimal Realtime Damage Identification in Composite Structures, Phase I

(<https://techport.nasa.gov/image/133414>)

**Final Summary Chart Image**

Optimal Realtime Damage Identification in Composite Structures, Phase I Project Image
(<https://techport.nasa.gov/image/126690>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Intelligent Fiber Optic Systems Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

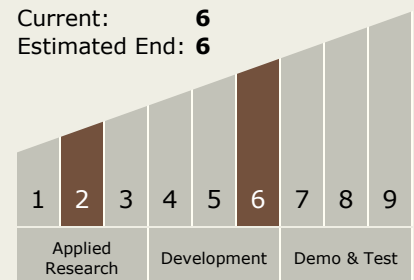
Richard J Black

Technology Maturity (TRL)

Start: **2**

Current: **6**

Estimated End: **6**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.3 In-Situ Instruments and Sensors
 - └ TX08.3.5 Electromagnetic Wave Based Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System